Report No. MCR-22-0290
April 26,2022

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX110

DEVICE : R5F5110XXX

APPLICATION : Consumer / Industry

Quality Assurance Div.
Renesas Electronics Corporation

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(Rev.5.0-2 October 2020)

Table. Reliability test results (QFP)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 ℃ to 150 ℃ , 300 cycles	0/22	
Latch-Up (LU)	JESD78	Pulse Current Injection, I=+/-150 mA	0/3	
Electrostatic discharge (ESD-HBM)	JS-001	1.5 kΩ, 100 pF, +/-2000 V, 1 time	0/3	Class: 2
Electrostatic discharge (ESD-CDM)	JEITA ED-4701/302	+/-1000V,1time	0/3	Class: Equivalent to C2b
Solderability (SD)	J-STD-002	245 ℃, 5 s, Solder coverage ≥95 %	0/5	
Resistance to Soldering Heat (PC)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3)	0/22	

*1) With preconditioning per JESD22-A113, MSL 3
・It is tested to confirm that all the samples are satisfied with an individual product specification.

Note :
Basically qualification tests were performed using a representative product with the same wafer process and the same package structure .

Table. Reliability test results (QFN)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 ℃ to 150 ℃ , 300 cycles	0/22	
Latch-Up (LU)	JESD78	Pulse Current Injection, I=+/-150 mA	0/3	
Electrostatic discharge (ESD-HBM)	JS-001	1.5 kΩ, 100 pF, +/-2000 V, 1 time	0/3	Class: 2
Electrostatic discharge (ESD-CDM)	JEITA ED-4701/302	+/-1000V,1time	0/3	Class: Equivalent to C2b
Solderability (SD)	J-STD-002	245 ℃, 5 s, Solder coverage ≥95 %	0/5	
Resistance to Soldering Heat (PC)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3)	0/22	

*1) With preconditioning per JESD22-A113, MSL 3
・It is tested to confirm that all the samples are satisfied with an individual product specification.

Note :
Basically qualification tests were performed using a representative product with the same wafer process and the same package structure .

Table. Reliability test results (LGA)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-55 ℃ to 125 ℃ , 500 cycles	0/22	
Latch-Up (LU)	JESD78	Pulse Current Injection, I=+/-150 mA	0/3	
Electrostatic discharge (ESD-HBM)	JS-001	1.5 kΩ, 100 pF, +/-2000 V, 1 time	0/3	Class: 2
Electrostatic discharge (ESD-CDM)	JEITA ED-4701/302	+/-1000V,1time	0/3	Class: Equivalent to C2b
Resistance to Soldering Heat (PC)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3)	0/22	

*1) With preconditioning per JESD22-A113, MSL 3
・It is tested to confirm that all the samples are satisfied with an individual product specification.

Note :
Basically qualification tests were performed using a representative product with the same wafer process and the same package structure .

The failure rate of the device in an actual use condition can be estimated by the below procedure.

・Equation for the failure rate estimation (λ)

$$\lambda = \lambda b \times \pi T \quad (FIT)$$

①Unique failure rate (λb)

λb= 3.8 FIT

Unique failure rate at Ta=55 ℃ using 60 % confidence level.

②Temperature term (πT)

$$\pi T = exp\{11600 \times Ea \times (1/(273+55) - 1/(273+Ta))\}$$

Ea : Activation energy (eV)
Ta : Ambient temperature (℃)

πT simplified chart as Ea=0.7 eV												
Ta (℃)	40	50	55	60	65	70	75	80	85	90	100	110
πT	0.31	0.68	1	1.45	2.08	2.95	4.15	5.77	7.96	10.88	19.82	34.99

・MTTF (Mean Time To Failure)

$$MTTF = 1/\lambda$$

Reference about Renesas package code

Package type		Package code *1
Lead type plastic package	QFP	PxQP
Non-lead type plastic package	QFN	PxQN
Grid array type plastic package	BGA	PxBG
	LGA	PxLG

*1. First four digit

Table. Product list

No	Group	Product part number	Package code
1	RX110	R5F51101ADFK	PLQP0064G*
2	RX110	R5F51101AGFK	PLQP0064G*
3	RX110	R5F51103ADFK	PLQP0064G*
4	RX110	R5F51103AGFK	PLQP0064G*
5	RX110	R5F51104ADFK	PLQP0064G*
6	RX110	R5F51104AGFK	PLQP0064G*
7	RX110	R5F51105ADFK	PLQP0064G*
8	RX110	R5F51105AGFK	PLQP0064G*
9	RX110	R5F5110JADFK	PLQP0064G*
10	RX110	R5F5110JAGFK	PLQP0064G*
11	RX110	R5F51101ADFL	PLQP0048K*
12	RX110	R5F51101AGFL	PLQP0048K*
13	RX110	R5F51103ADFL	PLQP0048K*
14	RX110	R5F51103AGFL	PLQP0048K*
15	RX110	R5F51104ADFL	PLQP0048K*
16	RX110	R5F51104AGFL	PLQP0048K*
17	RX110	R5F51105ADFL	PLQP0048K*
18	RX110	R5F51105AGFL	PLQP0048K*
19	RX110	R5F5110JADFL	PLQP0048K*
20	RX110	R5F5110JAGFL	PLQP0048K*
21	RX110	R5F51101ADFM	PLQP0064K*
22	RX110	R5F51101AGFM	PLQP0064K*
23	RX110	R5F51103ADFM	PLQP0064K*
24	RX110	R5F51103AGFM	PLQP0064K*
25	RX110	R5F51104ADFM	PLQP0064K*
26	RX110	R5F51104AGFM	PLQP0064K*
27	RX110	R5F51105ADFM	PLQP0064K*
28	RX110	R5F51105AGFM	PLQP0064K*
29	RX110	R5F5110JADFM	PLQP0064K*
30	RX110	R5F5110JAGFM	PLQP0064K*
31	RX110	R5F51101ADLF	PWLG0064K*
32	RX110	R5F51103ADLF	PWLG0064K*
33	RX110	R5F51104ADLF	PWLG0064K*
34	RX110	R5F51105ADLF	PWLG0064K*
35	RX110	R5F5110JADLF	PWLG0064K*
36	RX110	R5F51101ADLM	PWLG0036K*
37	RX110	R5F51103ADLM	PWLG0036K*
38	RX110	R5F5110HADLM	PWLG0036K*
39	RX110	R5F5110JADLM	PWLG0036K*
40	RX110	R5F51101ADNE	PWQN0048K*
41	RX110	R5F51101AGNE	PWQN0048K*
42	RX110	R5F51103ADNE	PWQN0048K*
43	RX110	R5F51103AGNE	PWQN0048K*
44	RX110	R5F51104ADNE	PWQN0048K*
45	RX110	R5F51104AGNE	PWQN0048K*
46	RX110	R5F51105ADNE	PWQN0048K*
47	RX110	R5F51105AGNE	PWQN0048K*
48	RX110	R5F5110JADNE	PWQN0048K*
49	RX110	R5F5110JAGNE	PWQN0048K*
50	RX110	R5F51101ADNF	PWQN0040K*

No	Group	Product part number	Package code
51	RX110	R5F51101AGNF	PWQN0040K*
52	RX110	R5F51103ADNF	PWQN0040K*
53	RX110	R5F51103AGNF	PWQN0040K*
54	RX110	R5F5110HADNF	PWQN0040K*
55	RX110	R5F5110HAGNF	PWQN0040K*
56	RX110	R5F5110JADNF	PWQN0040K*
57	RX110	R5F5110JAGNF	PWQN0040K*
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